

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

REC'D 23 FEB 2006

WIPO

PCT

To:  
SEMICONDUCTOR ENERGY LABORATORY  
CO., LTD.

398, Hase, Atsugi -shi, Kanagawa  
2430036 Japan

## PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY  
(PCT Rule 43bis.1)

Date of mailing (day/month/year)	21.02.2006
-------------------------------------	------------

Applicant's or agent's file reference  
PCT8464-8594

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/JP2005/024212

International filing date (day/month/year)  
26.12.2005

Priority date (day/month/year)  
28.12.2004

International Patent Classification (IPC) or both national classification and IPC  
Int.Cl. C07D209/88 (2006.01), C09K11/06 (2006.01), H01L51/50 (2006.01)

Applicant  
SEMICONDUCTOR ENERGY LABORATORY CO., LTD.

**1. This opinion contains indications relating to the following items:**

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☒ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

**2. FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

**3. For further details, see notes to Form PCT/ISA/220.**

Date of completion of this opinion	13.02.2006
------------------------------------	------------

Name and mailing address of the ISA/JP

**Japan Patent Office**

3-4-3, Kasumigasaki, Chiyoda-ku, Tokyo 100-8915, Japan

Authorized officer

**ANDO MICHIO**

Telephone No. +81-3-3581-1101 Ext. 3491

4P 9837

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/JP2005/024212

Box No. I

Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
  - ☒ the international application in the language in which it was filed
  - ☐ a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material
    - ☐ a sequence listing
    - ☐ table(s) related to the sequence listing
  - b. format of material
    - ☐ on paper
    - ☐ in electronic form
  - c. time of filing/furnishing
    - ☐ contained in the international application as filed
    - ☐ filed together with the international application in electronic form
    - ☐ furnished subsequently to this Authority for the purposes of search
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/JP2005/024212

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>18, 19</u>	YES
	Claims	<u>1-17, 20-24</u>	NO
Inventive step (IS)	Claims	<u></u>	YES
	Claims	<u>1-24</u>	NO
Industrial applicability (IA)	Claims	<u>1-24</u>	YES
	Claims	<u></u>	NO

2. Citations and explanations:

D1: WO 2003/048268 A1 (TOYO INK MFG CO LTD) 2003.06.12

D2: JP 2003-129043 A (TOYO INK MFG CO LTD) 2003.05.08

D3: JP 09-134020 A (CANON KK) 1997.05.20

D4: LIU, D., Enhancement in brightness and efficiency of organic electroluminescent device using novel N,N-di(9-ethylcarbaz-3-yl)-3-methylaniline as hole injecting and transporting material, Synthetic Metals (2004.10.14), Vol.146, No.1, pp.85-89

D5: BALIONYTE, A., Synthesis and properties of polymers containing aromatic amino groups in the main chain and their glass-forming model compounds, European Polymer Journal (2004/08), Vol.40, No.8, pp.1645-1650

D6: BALIONYTE, A., Potential hole-transport materials prepared by Ullmann coupling, Environmental and Chemical Physics (2002), Vol.24, No.1, pp.30-34

D7: JUSTIN, T. K. R., Light-Emitting Carbazole Derivatives: Potential Electroluminescent Materials, Journal of the American Chemical Society (2001), Vol.123, No.38, pp.9404-9411

D8: JP 2004-288380 A (KONICA CORP) 2004.10.14

D9: JP 10-265773 A (TOYO INK MFG CO LTD) 1998.10.06

D10: JP 62-280850 A (CANON KK) 1987.12.05

D11: JUSTIN, T. K. R., Cyanocarbazole Derivatives for High-Performance Electroluminescent Devices, Adv. Funct. Mater. (2004/04), VOL.14, NO.4, pp.387-392

The subject matter of claims 1-17, 20-24 does not appear to be novel with respect to D1-7.

The subject matter of claims 1-6, 8-17, 20-24 does not appear to be novel with respect to D1.

D1 discloses that the carbazole derivative represented by the formula (1) (see page 12 compound A24) is useful for a light emitting element.

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/JP2005/024212

Box No. VI      Certain documents cited

1.    Certain published documents (Rules 43 *bis*.1 and 70.10)

Application No. Patent No.	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
JP 2006-028176 A (SAMSUNG SDI CO LTD) [E, X]	02. 02. 2006	07. 07. 2005	14. 07. 2004
JP 2005-290000 A (SAMSUNG SDI CO LTD) [E, X]	20. 10. 2005	01. 04. 2005	02. 04. 2004

2.    Non-written disclosures (Rules 43 *bis*.1 and 70.9)

Kind of non-written disclosure	Date of non-written disclosure (day/month/year)	Date of written disclosure referring to non-written disclosure (day/month/year)

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: V

The subject matter of claims 1-6, 8-17, 20-24 does not appear to be novel with respect to D2.

D2 discloses that the carbazole derivative represented by the formula (1) (see page 19 compound 45-48) is useful for a light emitting element.

The subject matter of claims 1-6, 8-17, 20-24 does not appear to be novel with respect to D3.

D3 discloses that the carbazole derivative represented by the formula (1) (see page 4-7 compound No. 1-33) is useful for a light emitting element.

The subject matter of claims 1, 3, 5, 6, 9-11, 13, 20-24 does not appear to be novel with respect to D4.

D4 discloses that the carbazole derivative represented by the formula (1) (see page 86 DECMA) is useful for a light emitting element.

The subject matter of claims 1, 3, 5, 6, 9-11, 13, 20-24 does not appear to be novel with respect to D5.

D5 discloses that the carbazole derivative represented by the formula (1) (see page 1647 compound No. 5) is useful for a light emitting element.

The subject matter of claims 1, 3, 5, 6, 9-11, 13, 20-24 does not appear to be novel with respect to D6.

D6 discloses that the carbazole derivative represented by the formula (1) (see page 31 compound No. 6) is useful for a light emitting element.

The subject matter of claims 1, 2, 4, 5, 7, 9, 10, 12, 13, 16, 17, 20-24 does not appear to be novel with respect to D7.

D7 discloses that the carbazole derivative represented by the formula (1) (see page 9406 compound No. 16) is useful for a light emitting element.

The subject matter of claims 1-24 does not appear to involve an inventive step with respect to D1-11.

D1-11 indicate that carbazole derivatives useful for a light emitting element are excellent in terms of the hole injecting property and the hole transporting property, and they also indicate that they may be substituted by various substituents equivalent to a general formula (1) of the current patent application (see D1-7 above-mentioned, D8 page 10 compound No. 30, D9 page 36 compound No. 85, D10 page 3 compound No. 13, D11 page 387 compound No. 4).

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

REC'D 23 FEB 2006

WIPO

PCT

To:  
SEMICONDUCTOR ENERGY LABORATORY  
CO., LTD.

398, Hase, Atsugi -shi, Kanagawa  
2430036 Japan

## PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY  
(PCT Rule 43bis.1)

Date of mailing (day/month/year)	21.02.2006
-------------------------------------	------------

Applicant's or agent's file reference  
PCT8464-8594

**FOR FURTHER ACTION**

See paragraph 2 below

International application No.  
PCT/JP2005/024212

International filing date (day/month/year)  
26.12.2005

Priority date (day/month/year)  
28.12.2004

International Patent Classification (IPC) or both national classification and IPC  
Int.Cl. C07D209/88 (2006.01), C09K11/06 (2006.01), H01L51/50 (2006.01)

Applicant

SEMICONDUCTOR ENERGY LABORATORY CO., LTD.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☒ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Date of completion of this opinion

13.02.2006

Name and mailing address of the ISA/JP

**Japan Patent Office**

3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan

Authorized officer

**ANDO MICHIO**

Telephone No. +81-3-3581-1101 Ext. 3491

4P 9837

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/JP2005/024212

Box No. I      Basis of the opinion

1. With regard to the language, this opinion has been established on the basis of:
  - ☒ the international application in the language in which it was filed
  - ☐ a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material
    - ☐ a sequence listing
    - ☐ table(s) related to the sequence listing
  - b. format of material
    - ☐ on paper
    - ☐ in electronic form
  - c. time of filing/furnishing
    - ☐ contained in the international application as filed
    - ☐ filed together with the international application in electronic form
    - ☐ furnished subsequently to this Authority for the purposes of search
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

## PCT/JP2005/024212

### 1. Statement

## Claims

18, 19

YES

## Claims

1-17, 20-24

NO

## Claims

## Claims

1-24

YES

NO

## Claims

1-24

YES

## Claims

NO

D1: WO 2003/048268 A1 (TOYO INK MFG CO LTD) 2003.06.12

D2: JP 2003-129043 A (TOYO INK MFG CO LTD) 2003.05.08

D2: JP 2003-129043 A (TOYO INK MFG CO LTD) 2003.05.08

D3: JP 09-134020 A (CANON KK) 1997.05.20

D4: LIU, D., Enhancement in brightness and efficiency of organic electroluminescent device using novel N,N-di(9-ethylcarbaz-3-yl)-3-methylaniline as hole injecting and transporting material, Synthetic Metals (2004.10.14), Vol.146, No.1, pp.85-89

D5: BALIONYTE, A., Synthesis and properties of polymers containing aromatic amino groups in the main chain and their glass-forming model compounds, *European Polymer Journal* (2004/08), Vol.40, No.8, pp.1645-1650

D6: BALIONYTE, A., Potential hole-transport materials prepared by Ullmann coupling,

Environmental and Chemical Physics (2002), Vol. 24, No. 1, pp. 30-34

D7: JUSTIN, T. K. R., Light-Emitting Carbazole Derivatives: Potential Electroluminescent Materials, *Journal of the American Chemical Society* (2001), Vol.123, No.38, pp.9404-9411

D8: JP 2004-288380 A (KONICA CORP) 2004.10.14

D9: JP 10-265773 A (TOYO INK MFG CO LTD) 1998.10.06

D10: JP 62-280850 A (CANON KK) 1987.12.05

D11: JUSTIN, T. K. R., Cyanocarbazole Derivatives for High-Performance Electroluminescent Devices, Adv. Funct. Mater. (2004/04), VOL. 14, NO. 4, pp. 387-392

The subject matter of claims 1-17, 20-24 does not appear to be novel with respect to D1-7.

The subject matter of claims 1-6, 8-17, 20-24 does not appear to be novel with respect to D1.

DI discloses that the carbazole derivative represented by the formula (1) (see page 12 compound A24) is useful for a light emitting element.



WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/JP2005/024212

Box No. VI      Certain documents cited

1.    Certain published documents (Rules 43 *bis.* 1 and 70.10)

Application No. Patent No.	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
JP 2006-028176 A (SAMSUNG SDI CO LTD) [E, X]	02. 02. 2006	07. 07. 2005	14. 07. 2004
JP 2005-290000 A (SAMSUNG SDI CO LTD) [E, X]	20. 10. 2005	01. 04. 2005	02. 04. 2004

2.    Non-written disclosures (Rules 43 *bis.* 1 and 70.9)

Kind of non-written disclosure	Date of non-written disclosure (day/month/year)	Date of written disclosure referring to non-written disclosure (day/month/year)

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/JP2005/024212

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: V

The subject matter of claims 1-6, 8-17, 20-24 does not appear to be novel with respect to D2.

D2 discloses that the carbazole derivative represented by the formula (1) (see page 19 compound 45-48) is useful for a light emitting element.

The subject matter of claims 1-6, 8-17, 20-24 does not appear to be novel with respect to D3.

D3 discloses that the carbazole derivative represented by the formula (1) (see page 4-7 compound No. 1-33) is useful for a light emitting element.

The subject matter of claims 1, 3, 5, 6, 9-11, 13, 20-24 does not appear to be novel with respect to D4.

D4 discloses that the carbazole derivative represented by the formula (1) (see page 86 DECMA) is useful for a light emitting element.

The subject matter of claims 1, 3, 5, 6, 9-11, 13, 20-24 does not appear to be novel with respect to D5.

D5 discloses that the carbazole derivative represented by the formula (1) (see page 1647 compound No. 5) is useful for a light emitting element.

The subject matter of claims 1, 3, 5, 6, 9-11, 13, 20-24 does not appear to be novel with respect to D6.

D6 discloses that the carbazole derivative represented by the formula (1) (see page 31 compound No. 6) is useful for a light emitting element.

The subject matter of claims 1, 2, 4, 5, 7, 9, 10, 12, 13, 16, 17, 20-24 does not appear to be novel with respect to D7.

D7 discloses that the carbazole derivative represented by the formula (1) (see page 9406 compound No. 16) is useful for a light emitting element.

The subject matter of claims 1-24 does not appear to involve an inventive step with respect to D1-11.

D1-11 indicate that carbazole derivatives useful for a light emitting element are excellent in terms of the hole injecting property and the hole transporting property, and they also indicate that they may be substituted by various substituents equivalent to a general formula (1) of the current patent application (see D1-7 above-mentioned, D8 page 10 compound No. 30, D9 page 36 compound No. 85, D10 page 3 compound No. 13, D11 page 387 compound No. 4).